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ENTOMOLOGICAL NEWS

JULY, 1939

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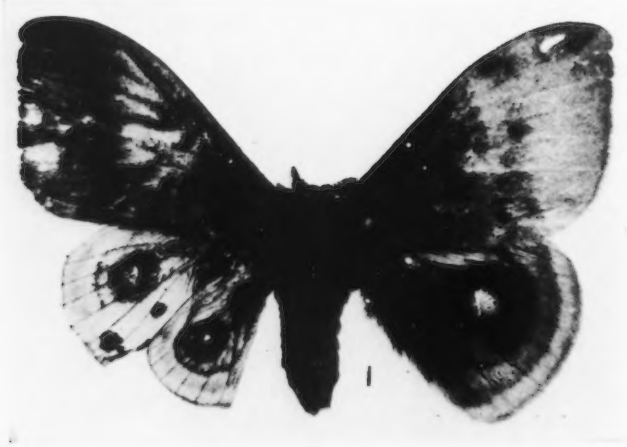

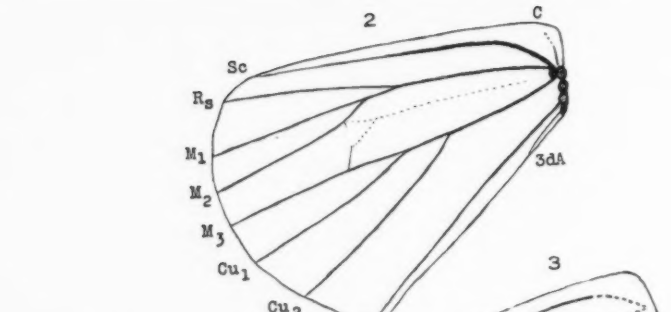

ABNORMAL IO MOTH, AUTOMERIS IO.—PHILLIPS.

ENTOMOLOGICAL NEWS

VOL. L. JULY, 1939 No. 7

A Male Io Moth (Automeris io) with Two Hind Wings on the Left Side (Lepid.: Saturniidae).

By ROBERT G. PHILLIPS, Norwood, Pennsylvania.

(Plate II.)

This abnormal male Io Moth was collected at Dalmatia, Northumberland County, Pennsylvania, on July 13, 1937, between 9:00 and 9:45 p. m. It was attracted to the lights of the gasoline station operated by H. K. Agnew and R. E. Cleaver, and was captured by one of these men. Previously, I had left a cyanide killing jar and an insect net with them so that insects which were attracted to these lights might be captured. Two other male Io Moths and a Big Poplar Sphinx Moth *(Pachysphinx modesta)* were captured this same evening. I did not observe the abnormal moth until the next morning while mounting these and other insects. It is most unfortunate that the abnormality was not seen before the insect was killed so that its flight might have been observed.

The hind wing shown in figure 2 was drawn from a normal specimen especially prepared to show wing veins, in the Entomological Laboratory of the University of Pennsylvania. There was some question about the presence of the third anal vein (3dA) and the closed cell on this specimen, to which Forbes (1923) refers. Further, there seemed to be a possibility that a rudimentary costa might be present. Consequently, the hind wings of three other normal male Io Moths were studied. These wings were prepared as follows: (a) the wings from one were removed and placed in cedar oil on microscope slides; (b) the wings from another moth were heated for a brief period in a ten per cent solution of potassium hydroxide, washed, spread until dry, descaled with a camel's-hair brush, and then placed in cedar oil as in (a); and (c) the third pair of wings were descaled as much as possible with a camel's hair

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brush and then placed in cedar oil as in (a). The wings prepared according to method (c) were superior to any used for the study of venation. Study of these wings verified the presence of a rudimentary third anal vein and a rudimentary costa. This costal (?) vein did not seem to be the humerus which is present in some Lepidoptera. The cell was not closed as Forbes (1923) states. There is present, however, a fairly long piece of the lower discocellular projecting anteriorly from M_3 and a shorter piece of the discocellular projecting posteriorly from M_2, but they do not meet. When the wings which were prepared according to method (c) were lifted out of the celar oil, or moved so that no oil covered them, a faint line became visible in the chitin between the radius and the cubitus. This line corresponds to the media in position, although it appears as a slight ridge and is not a vein. The location of this ridge is indicated by the dotted line in figure 2.

Figure 3 illustrates the venation of the anterior hind wing from the left side of the abnormal moth. Neither of the abnormal wings was removed and as a result not all the veins could be seen. The dotted lines indicate the probable locations of veins, or parts of veins, the presence of which could not be determined because something (many scales, etc.) may have obscured them. The third anal vein and the discocellular projection from M_2 could not be seen in this wing, which otherwise seemed to have venation corresponding to the normal wing. The wing is a little smaller than a normal wing and differs somewhat in shape as the figures show. A small projection which appears to be chitinous extends outward on the outer margin from between the subcosta and the radial sector. This peculiar structure is .4 mm. long.

In figure 4 the venation of the posterior hind wing can be observed. The venation corresponds to that of the anterior hind wing except that only a small part of the second anal vein could be seen. The anal edge of this wing is slightly folded and that makes it very difficult to see the second anal vein. Since no part of it could be seen at the distal end there is no

dotted line to indicate its probable existence. This wing is somewhat smaller than the anterior abnormal wing but corresponds more closely to the normal wing in shape. The costal margin of this wing fits under the anal margin of the wing anterior to it. The relationship between the abnormal wings seems to be similar to the relationship which exists between a normal hind wing and a normal fore wing, the wings being entirely separate.

The two abnormal wings vary somewhat from the normal in both shape and size. In color and venation they seem to be almost duplicates of each other and to resemble the normal wing very closely. The third anal vein and the costal vein could not be seen on the abnormal wings but it is easily possible that scales and hairs obscured them completely. The lower discocellular projections were probably hidden in the same manner since only one piece, the anterior projection from M_3 on the anterior hind wing, could be seen.

The complete condition of the veins in these two abnormal hind wings differs, in this case, from those described by Hering (1926): "Ein Übergang zu den monstra per defectum bilden die Fälle, in denen das Auftreten eines überzähligen Flügels beobachtet wurde. So ist berichtet worden von einer *Macrothylacia rubi* L. mit einem überzähligen Hinterflügel; eine *Lasiocampa quercus* L. soll auf der linken Seite zwei Vorderflügel besessen haben. In Wirklichkeit erfolgt hier nicht die Neubildung eines überzähligen Flügels; untersucht man die geschilderten Fälle genauer, so kann man feststellen dass sich der sogenannte fünfte Flügel auf Kosten eines andern entwickelt hat; in Wirklichkeit ist nämlich kein neuer Flügel ausgebildet worden, sondern einer der normalen hat sich geteilt (natürlich in einem sehr frühen Stadium, wahrscheinlich schon in der Imaginalscheibe), so dass aus einem Flügel zwei geworden sind, die aber nur zusammen das Geäder etwa eines Flügels besitzen." (p. 435, lines 13-25).

The wing veins were identified according to Forbes (1923) who shows a figure (415) of the venation of a male *Automeris io*. Comstock (1918) illustrates the venation of *Citheronia*

regalis which corresponds closely to that of *Automeris io*. These two authorities agree on all veins of the hind wing of *Citheronia regalis* except that Comstock labels the most anterior vein as Sc + R_1 (subcosta + first branch of the radius), and Forbes recognizes it as Sc (subcosta). It follows, therefore, that if the wing drawings were labeled according to Comstock the most anterior vein would be labeled Sc + R_1 instead of Sc.

The photograph of the moth (Fig. 1) shows that the abnormal wings are not as well covered with scales as is the normal hind wing. It is possible that some of these scales may have been rubbed off. Two dark spots can be seen posterior to the eyespot on the anterior abnormal wing. These spots are visible on both upper and lower surfaces because of the dearth of scales, and seem to be due to foreign matter which adheres to the ventral surface of the wing. The wing spread of this abnormal specimen is 61 mm., and the wing spread of the normal moth which was used for figure 2 is 58 mm.

This article was written at the suggestion and under the supervision of Dr. Philip P. Calvert, Professor of Zoology, at the University of Pennsylvania.

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EXPLANATION OF PLATE II.

Figure 1. Photograph of abnormal *Automeris io*, male. Dalmatia, Northumberland County, Pennsylvania; July 13, 1937; by Mr. Herman A. Walters.

Figure 2. Venation of a normal hind wing of *A. io*, ♂. (maximum length — 23 millimeters; maximum width — 17 millimeters.)

Figure 3. Venation of the anterior hind wing of the abnormal *A. io*, ♂. (maximum length—22.5 mm.; maximum width —12.5 mm.)

Figure 4. Venation of the posterior hind wing of the abnormal *A. io*, ♂. (maximum length — 17 mm.; maximum width — 11 mm.)

C, costa; Sc. subcosta; Rs, radial sector; M_1, M_2, M_3, branches of media; Cu_1, Cu_2, branches of cubitus; 2dA, second anal vein; 3dA, third anal vein.

A Questionable Practice in the Bureau of Entomology and Plant Quarantine.

By Henry Fox, Department of Biology, University College, New York University.

It is apparently not a matter of general knowledge that an editorial policy exists in, at least, one of the professedly scientific bureaus of the Government which, as applied in the instance here under review, would appear to have highly questionable ethical implications. In 1935, in response to a request from C. H. Hadley for information desired for an article then being written, I prepared a brief outline of the results to date of a personal study of the conditions likely to influence the distribution of the Japanese beetle on this continent. This paper, which was written after the termination of my employment in the Bureau, was furnished Mr. Hadley upon the strength of an agreement on his part to accord full recognition to the source.

The published article by Mr. Hadley entitled "Progress of Japanese Beetle Investigations" appeared last year (1938) in the June number of the Journal of the New York Entomological Society. An entire paragraph in this article devoted to the question of the ultimate distribution of the beetle is a virtually verbatim transcript of the paper referred to above as furnished Mr. Hadley upon his agreement to accord recognition to the source. In his article as published this recognition is withheld.

Shortly after his attention was called to this evident violation of his agreement, I received a note from Mr. Hadley in which

he disclaimed personal responsibility for the omission, charging that it lay with the Editorial Office of the Bureau of Entomology and Plant Quarantine. He claimed that the original draft of his article contained a footnote in which an unpublished "manuscript" of mine was cited as the source and that this had been deleted by the Editorial Office against his protest.

Inquiry addressed to the Editorial Office elicited from the Chiefs of the Bureau, Lee A. Strong and S. A. Rohwer, information which substantiated the charge made by Mr. Hadley. As justification for the deletion from the latter's article of reference to my contribution, Mr. Strong merely stated that it is the general practice of the Editorial Office of the Bureau to delete references to unpublished reports, giving as a reason the fact that such reports would not be available to the readers of the article. Later, in reply to a letter in which I called his attention to a retention of references to unpublished reports in another article[1], Mr. Rohwer stated that this rule applied only to reports upon officially assigned projects.

By way of comment upon the assumption made by the heads of the Bureau that the paper utilized by Mr. Hadley was a "report" upon an officially assigned subject, I need first to emphasize the fact that the so-called report was written when I was not employed in the Bureau and when, in consequence, I was under no obligation to submit a report upon a study which *officially* came to an end with the terminatiin of my employment. It was prepared, as previously stated, in direct response to a request from Mr. Hadley, was never intended to be a report, or as more than a purely personal contribution to his article. Hence, the assumption that it was an official report, as implied by the Bureau officials, is without justification in fact.

As an additional reason for challenging the right assumed by the Bureau to disregard the obligation of an author to acknowledge the source of his material, I may state that, even during the period of my employment in the Bureau, my study of the conditions likely to influence the ultimate distribution of

[1] Hawley, I. M. and G. F. White. Preliminary Studies on the Diseases of Larvae of the Japanese Beetle. Jour. N. Y. Ent. Soc. 43: 405-412. 1935.

the Japanese beetle was conducted for the most part unofficially, the speculative nature of the inquiry impressing me as unsuitable for an official project. It was only near the close of the period in question that the subject was officially recognized as a formal project of investigation. This came about as a result of repeated inquiries for information received by the Bureau, and referred to me for reply, upon the chances of establishment of the beetle in more or less remote sections of this continent.

At the termination of my official employment this study had not reached a stage at which, in my judgment, publication of the indicated results was desirable. Accordingly, as opportunity offered, it was continued independently, as a matter of personal interest, and the results are embodied in an article written during the past year and since accepted for publication as a contribution from the Department of Biology of New York University. Some of the earlier results of this unofficial extension of the study were included in the outline furnished Mr. Hadley in 1935.

The implied claim of the head officials of the Bureau of Entomology and Plant Quarantine that my brief outline of 1935 represented an official report would thus appear to rest upon a very questionable basis. Nevertheless, the sole reason which those officials have offered to justify the inclusion of the material of that outline in Mr. Hadley's article, without acknowledgment of the source, is the existence in the Bureau of an editorial practice which precludes the citation in publications by its staff of unpublished reports upon officially assigned subjects. It is clear that in the application of this rule some provision needs to be made to guard against possible plagiarism in cases where a writer utilizes material supplied by others, but no hint of the existence of any check of this kind is given in the available official correspondence. Neither is any evidence submitted in the same documents to show that, in the present instance, due consideration was given to the obvious fact that means exist, other than direct citation of unpublished papers, whereby an author can record his obligations.

Immature Staphylinids of the Genus Quedius (Coleoptera: Staphylinidae*).

By RALPH VORIS, Southwest Missouri State Teachers College Springfield, Missouri.

(Continued from page 155.)

QUEDIUS SPELAEUS Horn.

Quedius spelaeus Horn, 1871, Trans. Amer. Ent. Soc. 3:332. Acc Horn, 1878, Trans. Amer. Ent. Soc. 7:158. Blatchley, 1926, 21st. Ann. Rep. Ind. Geol. & Nat. Resources 196. larva.

Egg. Unknown.

Larva. (acc. Blatchley) Length 15. mm.

Head with sides parallel, hind angles rounded; exuviae (in alcohol), testaceous to castaneous. *Clypeo-labral* margin with median tooth one-half length of first lateral; first lateral extremely long, conical; clypeal teeth all distinct, not forming with first lateral a smooth arc as first clypeal is below the arc formed by the third clypeals and the first laterals; clypeal teeth forming an angle of less than 30°. *Ocelli* absent. Antennae with second segment much longer than first; third shorter than second, "gibbous beyond the middle, the gibbosity with an external and an internal long bristle." (Blatchley 96:196); thumb present; fourth segment shorter than third. *Maxillae* with stipes about twice as long as cardo; lacinia slender; palps with three segments subequal in length; second segment with spine on inner surface near base and spine and outer surface near apex; third segment rapidly narrowed near middle continuing slender to the tip. *Labium* with dorsal surface of stipulae, palpigers, and posterior half of ligula densely covered with small spines; palpigers prominent; ligula small; palps with first segment much larger than second.

Abdomen with urogomphus biarticulate, confluently not as long as pseudopode; second segment short, distinct. *Pupa.* Undescribed.

The larvae and adults are said to occur in the caves of southern Indiana and northern Kentucky. Not represented in my collection.

QUEDIUS IRACUNDUS (Say).

Staphylinus fulgidus Fabricius, 1787, Mantissa Insectorum, Hafniae 1:22. acc Erichson, 1840, Genera et Species Coleopterorum 526.

Staphylinus iracundus Say, 1834, Trans. Amer. Phil. Soc. 4:449. Erichson, 1840, Genera et Species Coleopterorum 526.

Quedius fulgidus Erichson, 1840, Genera et Species Coleopterorum 525. Horn, 1878, Trans. Amer. Ent. Soc. 7:158. Blatchley & Wickham, 1896, 21st. Ann. Rep. Ind. Geol. and Hat. Res. 195. Banta. 1907, Carnegie Inst. Washington, pub. 67:31, fig. 3, pupa. Casey, 1915, Memoirs on the Coleoptera 411, 416.

Micrasaurus iracundus Casey, 1915, Memoirs on the Coleoptera 411, 416.

Quedius iracundus Leng, 1920, Cat. Coleop. Amer. N. of Mexico 110.

Egg. Unknown.

Larva. Unknown.

Pupa. Length 7.1 mm., Width 2.8 mm.; anterior margin of prothorax not bearing spines; lateral margins of the fourth, fifth, sixth, seventh, eighth and ninth abdominal segments each bearing one sharp, stiff spine; terminal spines of medium length, sharp; female accessory spines long and sharp.

The material available consists of one exuvia (female) and two adults, loaned by A. M. Banta. The adults were originally identified by H. F. Wickham as *Quedius fulgidus* Fabricius. The material is all from Mayfield's Cave, Bloomington, Indiana, being part of the material on which Banta's "The Fauna of Mayfield's Cave" was based. The adults have the eye and antennal characters mentioned by Casey.

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EXPLANATION OF PLATE I.

Fig. 1. *Quedius capucinus,* dorsal view head. Larva.

Fig. 2. *Quedius capucinus,* lateral view of head. Larva.

Fig. 3. *Quedius capucinus,* ventral view of head. Larva.,

Fig. 4. *Quedius molochinus,* dorsal view right half of head. Larva.

Fig. 5. *Quedius capucinus,* dorsal view. Pupa.

Fig. 6. *Quedius capucinus,* lateral view. Pupa.

Fig. 7. *Quedius capucinus,* ventral view. Pupa.

Fig. 8. *Quedius molochinus,* lateral view head. Larva.

Fig. 9. *Quedius capucinus,* lateral view seventh, eighth and ninth abdominal segment of female. Pupa.

Fig. 10. *Quedius capucinus,* lateral view seventh, eighth, and ninth abdominal segment of male. Pupa.

Fig. 11. *Quedius capucinus,* dorsal view labium. Larva.

Fig. 12. *Quedius molochinus,* ventral view clypeo-labral margin and the arrangement of spines around the mouth. Larva.

Fig. 13. *Quedius molochinus,* antenna. Larva.

Fig. 14. *Quedius capucinus,* antenna. Larva.

Fig. 15. *Quedius capucinus,* dorsal view right maxilla. Larva.

Fig. 16. *Quedius capucinus,* lateral view urogomphus and pseudopode. Larva.

Fig. 17. *Quedius capucinus,* Ventral view clypeo-labral margin and the arrangement of spines around the mouth. Larva.

Fig. 18. *Quedius capucinus,* dorsal, lateral and ventral plates of fourth abdominal segment. Larva.

Fig. 19. *Quedius molochinus,* gular suture and labium. Larva.

Fig. 20. *Quedius molochinus,* lateral view urogomphus and pseudopode. Larva.

Fig. 21. *Quedius molochinus,* ventrolateral view left maxilla. Larva.

A Preliminary Study of the Superfamily Papilionoidea in the Northern Portion of Pine County, Minnesota. (Lepidoptera).

By G. N. Rysgaard, Museum of Natural History, University of Minnesota.

A three year study of the Papilionidea of Sturgeon Lake, Pine County, Minnesota was made by the author during the summer months of 1936, 1937, and 1938. The period of observation during each summer extended from late June to late August.

The chief objective of the study was to establish locality dates and records for the area, since little work has been done in plotting the distribution of the lepidopteran fauna of this state. The secondary objective was to study the periodicity of abundance and scarcity in order to determine the life cycle periods. Thirdly, it was hoped that information as to local distribution according to habitat areas might be gained.

The area under study embraced many different habitats. A small tract of aged Norway and white pines stands as a nucleus of the area and represents sub-climax conditions; surrounding this and extending over a great proportion of the area is the jack pine forest which represents a still earlier stage of ecological succession. There are hardwood areas of basswood, maple, and oak that nearly equal the coniferous expanses and represent the climax vegetative type for this region. Large tracts of cleared land are maintained in short grass and small floral forms by grazing and recreational activities. Also fields of alfalfa are cultivated. There are two small lakes included in the area, both surrounded by swampland, one being chiefly a cat-tail marsh with an adjoining meadowland slough, while the second consists chiefly of wire grass with a surrounding growth of alder and willow. In addition, a small cranberry bog and an extensive tamarack-spruce swamp are to be found within the borders of the studied area. The shoreline of Sturgeon Lake is sandy, representing the pioneer stage of succession which rapidly dovetails into alder-willow brush succession and

thence into both coniferous and deciduous succession stages. Certain small areas along the beach are low and usually are extremely damp and contain standing water; here cat-tails, swamp milkweed, boneset, sun dew, and other helophytic forms are to be found.

The large number of varied habitats and environmental areas give support to a similar large number of Papilionoidea, forty-two species and three subspecies having been observed during the three year period. Two of this number, the Gulf Fritillary (*Dione vanillae*) and the Macoun's Arctic (*Oeneis macounii*), may be considered stragglers and not indigenous forms.

Following is an annotated list of those species taken during the period of study:*

4. Black Swallowtail (*Papilio ajax L.*), July 3, 1937.
15. Tiger Swallowtail (*Papilio glaucus turnus L.*), June 9, 1937.
41. Orange Sulphur (*Colias eurytheme* Bvd.) August 18, 1937.
42. Clouded Sulphur (*Colias philodice* Godt.), July 11, 1938.
45. Little Yellow (*Colias interior* Scud.), July 15, 1937.
75. Dainty Sulphur (*Nathalis iole* Bvd.), August 20, 1937.
82. Checkered White (*Pieris protodice protodice* Bwd. & Lec.), July 31, 1937.
82. Checkered White (*Pieris protodice vernalis* Edw.), June 9, 1937.
83. Gray-veined White (*Pieris napi* L.), August 4, 1937.
86. Cabbage Butterfly (*Pieris rapae* L.), August 18, 1937.
89. Monarch (*Danaus plexippus* L.), August 18, 1937.
96. Pearly Eye (*Enodia portlandia* Fabr.), July 14, 1937.
103. Little Wood-satyr (*Megisto eurytus* Fabr.), July 2, 1937.
106. Eyed Brown (*Satyrodes eurydice* Joh.), July 13, 1937.
117c. Grayling (*Minois alope nephele* Fabr.), July 14, 1937.
125. Macoun's Arctic (*Oeneis macounii* Edw.), July 2, 1935.
158. Gulf Fritillary (*Dione vanillae* L.), July 23, 1936.
159. Variegated Fritillary (*Euptoieta claudia* Cram.), July 23, 1938.
166. Great Spangled Fritillary (*Argynnis cybele* Fabr.), July 30, 1938.
167. Silver-spot Fritillary (*Argynnis aphrodite* Fabr.), July 14, 1938.

*Classification reference: Check List of the Lepidoptera of Canada and the United States, J. McDUNNOUGH, Memoirs of the Southern California Academy of Sciences, Part I, Macrolepidoptera, June 15, 1938.

167a. Silver-spot Fritillary (*Argynnis aphrodite alcestis* Edw.), July 15, 1938.
171. Mountain Silver-spot Fritillary (*Argynnis atlantis* Edw.), July 13, 1938.
200. Silver-bordered Fritillary (*Brenthis myrina* Cram.), July 31, 1937.
212. Meadow Fritillary (*Brenthis bellona* Fabr), July 12, 1937.
263. Silver Crescent (*Phyciodes nycteis* Dbdy. & Hew.), June 29, 1937.
265. Pearl Crescent (*Phyciodes tharos marcia* Edw.), July 2, 1937.
265. Pearl Crescent (*Phyciodes tharos* Dru.), July 29, 1938.
285. Violet Tip (*Polygonia interrogationis* Fabr.), August 1, 1938.
286. Hop Merchant (*Polygonia comma* Harris), July 29, 1937.
288. Green Comma (*Polygonia faunus* Edw.), July 24, 1938.
294. Gray Comma (*Polygonia progne* Cram.), July 19, 1937.
295. Compton's Tortoise-shell (*Nymphalis j-album* Bvd. & Lec.), July 31, 1937.
297. American Tortoise-shell (*Nymphalis milberti* Godt), August 12, 1938.
298. Mourning Cloak (*Nymphalis antiopa* L.), August 12, 1938.
299. Red Admiral (*Vanessa atalanta* L.), August 3, 1938.
300. Painted Beauty (*Vanessa virginiensis* Dru.), July 31, 1937.
301. Cosmopolite (*Vanessa cardui* L.), August 4, 1936.
303. Buckeye (*Junonia coenia* Hbn.), August 12, 1937.
321. Banded Purple (*Basilarchia arthemis* Dru.), August 4, 1937.
325. Viceroy (*Basilarchia archippus* Cram.), August 4, 1937.
435. American Copper (*Lycaena hypophlaeas* Bdv.), August 5, 1938.
447. Tailed Blue (*Everes comyntas* Godt.), June 26, 1938.
449. Scudder's Blue (*Plebeius scudderi* Edw.), June 27, 1938.
450. Spring Azure (*Plebeius melissa* Edw.), June 29, 1938.
473. Silvery Blue (*Glaucopsyche lygdamus* Dbdy.), June 26, 1937.

The occurrence of the Gulf Fritillary may be accounted for by the fact that a boys' camp is located in the center of the area, and tourists from the South are not uncommon. Possibly this specimen was carried by a car from the South, the speci-

men was badly damaged. It is now in the University of Minnesota collection on the Agricultural College campus. The Macoun's Arctic is found on the northern shore of Lake Superior in the Dominion of Canada, and one was taken by the author on Isle Royale, Lake Superior, in 1934. The Macoun's Arctic is a northern species with its southern limits in lower Canada. Both of these species are first records for Minnesota.

Habitat Areas.

An attempt is here made to ascribe habitat areas to the different species. This is a difficult task, for butterflies are so very active and wander over large areas of varying environmental conditions. In some instances, however, rather definite habitats may be associated with them.

Communities.

Basswood-Maple Climax: No species found commonly in this area, although at its boundaries facing open areas many Nymphalidae are to be observed.

Norway-White Pine Sub-Climax: Nearly devoid of all Papilionoidea.

Jack Pine Forest: The Compton's Tortoise-shell (*Nymphalis j-album*) specimens were all collected in the dense jack pine tracts where there appeared a scattering of birch. This species may be considered the predominant in this habitat; it is practically the sole species of Papilionoidea inhabiting the dense forest. However, where small clearings are made in the jack pine and such plants as blazing star (*Liatris*), wild bergamot (*Monarda fistulosa*), and certain Compositae had appeared, the fritillaries and swallowtails were present in considerable numbers.

Alfalfa Fields: The *Pieridae,* as would be expected, predominate in this habitat, being represented by the Clouded Sulphur (*Colias philodice*), Orange Sulphur (*Colias eurytheme*), Cabbage (*Pieris rapae*), Checkered White (*Pieris protodice* sp.), and Gray-veined White (*Pieris napi*) in order of their abundance. Where thistle was found infesting the alfalfa fields, especially along its borders, the Painted Beauty (*Vanessa virginiensis*) and the larger fritillaries were frequently seen. The greater abundance of the *Colias philodice*

and *Colias eurytheme* probably is explained by the greater amount of available food, clover and vetch, both abundant to excess, being the food plants of the two aforementioned species. The other three Pieridae depended upon the much scarcer Cruciferae, found chiefly in the form of bulbous cress (*Cardamine bulbosa*).

Willow, Alder, and Hazel Brush: In areas of brush bordering open expanses or areas of loose brush, the Grayling (*Minois alope nephele*), Pearly Eye (*Enodia portlandia*), Eyed Brown (*Satyrodes eurydice*), and the Little Wood-satyr (*Megisto eurytus*) were common as were also the *Lycaenidae* represented by the Silvery Blue (*Glaucopsyche lygdamus*), Scudder's Blue (*Plebeius scudderi*), Spring Azure (*Plebeius melissa*), and the Tailed Blue (*Everes comyntas*). This latter group shows preference for the loose brush areas with interspaces of grass and clover. This same type of habitat appeals to the Silver Crescent (*Phyciodes nycteis*) and the Pearl Crescent (*Phyciodes tharos* sp.). The few Meadow Fritillaries (*Brenthis bellona*) taken were all captured here. The large fritillaries should be placed in this group, for it is in the brush country of this type that they are found most abundantly; and it is here that the larvae find food in the numerous violet plants. Their strong wings and wanderlust spirit lead them into nearly all environmental situations, and they may be expected to appear almost anywhere. The large fritillaries may be annotated as the Silver-spot (*Argynnis aphrodite* and also variety *alcestis*), Mountain Fritillary (*Argynnis atlantis*), Great Spangled Fritillary (*Argynnis cybele*), and the Variegated Fritillary (*Euptoieta claudia*). The Banded Purple (*Basilarchia arthemis*) and the Mourning Cloak (*Nymphalis antiopa*) should also be mentioned. Although the larvae of the Mourning Cloak feeds on the willow and may be found in abundance on the willow brush, the adult prefers the open beaches. It must be remembered that many types of willow, which also serve as food, are found growing along the lake shore.

Wire-grass Bog Bordering Interior Lake: The predominant species in this community is the Silver-bordered Fritillary (*Brenthis myrina*).

Cat-tail, Wire-grass, Willow Swamp Surrounding Interior Lake: The Viceroy (*Basilarchia archippus*) is the outstanding species inhabiting this community.

Sand-beach Community: This community is perhaps one of the most interesting of all those studied. An expanse of some thirty yards of scantily vegetated sandy shore surrounds Sturgeon Lake in the area studied and shows progressive succession from the pioneer community at the lake shore to the climax hardwood forest or sub-climax coniferous forest which lies about one hundred yards from the present shoreline and represents the original shoreline. A large portion of this shoreline supports typical sand dune community forms such as the Mutillidae, Bembecidae, Lycosidae, Cicindelidae. In this dry sand area are found the Buckeye (*Junonia coenia*), American Tortoise-shell (*Nymphalis milberti*) and the several *Polygonia*. In the more moist and more advanced areas supporting richer vegetation, the Mourning Cloak (*Nymphalis antiopa*), Red Admiral (*Vanessa atalanta*) and the Painted Beauty (*Vanessa virginiensis*) predominate; and each, in the height of its abundance, swarms on the beach. Low areas near the lake shore have resulted in growths of swamp milkweed, cat-tail, and sedge. Among these are found the diminutive American Copper (*Lycaena hypophlaeas*) and the Dainty Yellow (*Nathalis iole*).

This general distribution of the Papilionoidea as to habitat includes all those forms or species of common occurrence. Others were observed, of course, but not in sufficient numbers to warrant any conclusions being drawn.

(To be continued.)

The Biological Photographic Association.

The ninth annual Convention of the Biological Photographic Association will be held September 14th-16th, at the Mellon Institute for Industrial Research, Pittsburgh, Pennsylvania. The program will be of interest to scientific photographers,

scientists who use photography as an aid in their work, teachers in the biological fields, technical experts and serious amateurs. It will include discussions of motion picture and still photography, photomicrography, color and monochrome films, processing, etc., all in the field of scientific illustrating. Up-to date equipment will be shown in the technical exhibit; and the Print Salon will display the work of many of the leading biological photographers here and abroad.

The Biological Photographic Association was founded nine years ago because of the growing need for expert illustrative material for scientific research and teaching. Many workers were solving their problems in their own way. But obviously they were wasting time and effort in individually repeating experiments that had been worked out elsewhere. The B. P. A. was formed to act as a clearing house for new ideas, to pool experiences, record standard procedures and disseminate information. Its aims were scientific and all services have been volunteered by officers and members on a non-profit basis.

Further information about the Association and the Convention may be obtained by writing the Secretary of the Biological Photographic Association, University Office, Magee Hospital, Pittsburgh, Pennsylvania.

The Nomenclature of Categories Lower than Species.[1]

By CURTIS W. SABROSKY, Michigan State College.

A series of recent papers (1936-1938) has served to demonstrate the present uncertainty in the basic principles of the nomenclature of categories lower than species. The various interpretations of the nomenclatorial rules relating to this problem are so conflicting that it seems desirable to review them and to point out the complications into which they are leading us.

PREVAILING INTERPRETATIONS OF THE RULES.

The International Rules of Zoological Nomenclature actually mention only "subspecies" as lower than species, with no indication of the meaning and scope of the term. It is also stated that scientific names are "trimonial for subspecies".

[1] Journal Article No. 356 (n. s.) from the Michigan Agricultural Experiment Station.

These brief references appear to be interpreted in four principal ways among contemporary taxonomists, as follows:

1. *"Subspecies" includes all categories of lower rank than species;* therefore, all properly proposed names for such categories are valid and available.

One can infer that many taxonomists believe this, for in practice they propose infra-specific names—polynomials as well as trinomials—in proper Latin form, designate them as new, and accompany them with description and designation of type. Others use them, literature references pile up, biological data accumulate, changes of status are made, and soon the name is firmly entrenched in our voluminous literature.

2. *"Subspecies" in the Rules designates a definite concept, and is trinomial in form;* therefore, names of lower categories and polynomials are invalid and unavailable under the Code (e. g., Krombein, 1938, pp. 185, 186: "a varietal name has no status in nomenclature").

Like Krombein, Riley (1938, p. 31) maintains that names of categories lower than subspecies have "no status in scientific nomenclature". A trinomial form validates a name under the Rules, but only if it is definitely stated to be a subspecies, or in the absence of any statement to the contrary. If an author published a trinomial with the third name designated as "n.ab.", therefore, it would be rejected by Riley, although accepted by Hovanitz (see no. 3) with both claiming the correct interpretation of the Rules. Riley's deductions may not entirely bar the acceptance of names proposed as new races and varieties, if those names are regarded as *coequal* with and not *lower* than subspecies.

3. *The Rules recognize only one "subspecific" category, but trinomials are available regardless of their original rank.* (Hovanitz, 1938, p. 40: "Names proposed as bi- or trinomials are unaffected as to availability by reason of their having been originally described as of a biological category not generally considered of taxonomic significance.").

Thus the numerous names, particularly in Lepidoptera, which appear as new forms, aberrations, etc., are regarded as valid

if proposed in trinomial form, but unavailable if not. Riley (1938) has pointed out some objections to this conception.

4. *"Subspecies" of the Rules is the name for a concept regarded as an incipient species,* i. e., one stage in the process of speciation during which, by natural selection, isolation, or other factors, certain populations gradually assume a homogeneous distinctiveness from the parent stock.

This interpretation would accept the names of races, varieties, etc., when these are regarded as evolutionary elements[2], but would reject names for aberrations, color forms, seasonal forms, etc., as contrary to the spirit of the Code. One must admit that it might be difficult to agree upon "evolutionary stages."

The viewpoint is more selective than Hovanitz' (3), and shows a broader recognition of terminology than that of Krombein and Riley (2). Most taxonomists who habitually use the terms variety (in one sense at least) and race in proposing new names undoubtedly believe that these names are valid under our system of nomenclature. In many orders of insects the term "subspecies" seldom appears, whereas variety (Diptera, Hymenoptera in part) and race (Orthoptera, Odonata) are frequently used for the third rank in a trinominal combination.

Problems.

Among these diverse conceptions, certain problems can be recognized as of paramount importance.

Problem 1. What is the meaning of "subspecies"? Should the Rules be construed to mean *one* category which must be designated "subspecies", or should a more inclusive interpretation prevail?

In actual practice, I believe we shall find that the discarding of all names other than definitely designated "subspecies" would overthrow a vast amount of valuable taxonomic work, both past and present, and would contribute far more to confusion than a strict interpretation could hope to counterbalance. A few prominent examples from current usage may be adduced to illustrate the point.

[2] Bates, 1935, p. 71: "The term subspecies . . . might well be applied to any partially independent population considered to represent an evolutionary stage in the development of species."

(a). In his highly valued monograph on the genus *Cynips* (1930), Kinsey recognized the lack of uniformity in terminology, and adopted the term "variety" for his trinomial combinations. He pointed out, especially with maps, the geographical isolation of these "varieties", showing that they correspond indeed to race, subspecies or choromorph of other authors. In view of the possible doubt on the validity of names proposed as "varieties" (cf. Krombein), it is interesting to note that Kinsey later (1936) abandoned his use of the term and proposed to use *species* for all of his units previously called *varieties!* It may also be mentioned that his elevation of varieties to the rank of species thereby made trinomials of his quadrinomial names for the bisexual and agamic forms.

(b). It is significant that a widely quoted book, "The Species Problem" by G. C. Robson (1928), uses the word *variety*. I find only two mentions of "subspecies" in the entire book: one is a mere reference (p. 198) to a Pleistocene form of a modern species; the other is a footnote on p. 26 to the effect that "the term 'subspecies' is often used instead of 'variety' to denote well-marked subdivisions of species". The preference to the use of "variety" in this notable work by an English zoologist is but one more strong indication that we should not generalize too arbitrarily on names other than "subspecies".

(c). The difficulty of applying rules of nomenclature to the terminology of older works is illustrated in Creighton's discussion of the development of infra-specific ranks in Formicidae. As he points out (p. 4), the early use of "variety" (Emery, about 1885) was equivalent to the term "race" of Forel (1874). Emery introduced the name "subspecies" in the early 1890's, and the latter eventually supplanted the term "race". Within the past few years the term choromorph has also been used. Creighton closes the matter very neatly in these words (p. 9): "If most subspecies and varieties are choromorphs why need we longer attempt to distinguish between the two ranks? *Such a separation has always rested on an auctorial basis which cannot be subjected to analytical evaluation*". (italics are mine).

Problem 2. What is namable? Do all the named categories really deserve formal Latinized designations which would enter into nomenclature?

The question of whether various forms (aberrations, etc.) deserve names is a moot problem. The viewpoint of a body of Lepidopterists, in America at least, is that these should be named; the opposing view is concisely set forth by Ferris and Doudoroff (1936).

Problem 3. Should polynomials (quadrinomials, etc.) and names for categories lower than subspecies (sensu lato) be recognized in nomenclature?

An affirmative answer to this question would probably involve changes in the Rules, or at least a much broader interpretation than many would grant at present. In part, the question would be answered by settling the other problems.

It cannot be denied, as Riley has pointed out, that polynomials are names for things; the problem of nomenclature is what to do with the names. One Lepidopterist (Bates, 1935, p. 74) has remarked: "It seems to me that the Linnean nomenclature, if it is not to become hopelessly unwieldy, is best restricted to the classification of populations. The classification of individuals within the population — of seasonal forms, aberrations, dimorphic female forms, and the like—is essentially a separate problem." Although Bates definitely opposes the acceptance of such forms as nomenclatorial units, it is evident from his reference to unwieldiness that he considers the names already proposed as available under the Rules.

If we agreed with Hovanitz that polynomials are unavailable under the Code, what would prevent subsequent authors from proposing aberrations, etc., as trinomials, thus fulfilling his requirement for nomenclatorial status? But it seems incongruous to insist that a name is acceptable if proposed as *Erebia ligea* ab. *subcaeca* (trinomial), but unavailable if proposed as *Erebia ligea carthusianorum* ab. *subcaeca!* In both cases, the name, the "ab.", the concept, and the intent of the author are the same. Can one be rejected but the other accepted?

The position taken by Ferris and Doudoroff appears to be a

fair one, meriting the considered thought of all who deal with infra-specific categories. It may be summarized, perhaps a bit too bluntly, in three points:

(a). If you name any form, then consider the name in nomenclature.

(b). If a name is not to be recognized in nomenclature, don't name it.

(c). If you don't name it, and still wish to designate it in some way, then construct another system which will *not* enter into and complicate nomenclature (e. g., symbols in genetics, terminology of aphid life history, use of common names such as spring form, etc.).

Conclusions.

Whatever step is chosen, the whole situation points to the following *needs* of modern systematic zoology, especially in entomology:

1. A ruling as soon as possible on what names enter into nomenclature, defining the terms with fairness to all authors, with consideration for difference of usage, and with a view to avoiding confusion wherever possible.

2. Agreement on what is namable, and how to handle the remaining categories.

3. Acceptance of all past properly proposed names, of whatever rank, as entering into nomenclature and establishing priority. If we declare polynomials unavailable, repropose some, validate more recent names because of trinomial form, etc., etc., our taxonomy cannot help but be more or less confused. The literature will contain publications from authors with opposing views of validity. The tangle of available and unavailable, of valid and validated, of proposed and reproposed and unreproposed names, will be a morass of nomenclature for future taxonomists.

In the meantime, why assume that any one interpretation is the correct one, and make revisions accordingly? In the absence of an official opinion or interpretation, Riley, Hovanitz, Krombein, and others speak positively of their correct understanding of the Rules, and publish accordingly. But is all this scientific?

Must we pile error upon error, and revise errors with further errors, only to have to revise the whole situation again when a ruling finally becomes available? Can we not bide our time, seek a ruling which will clarify the entire situation, and thereby avoid further contributions to confusion? I believe in that way we can contribute far more to taxonomy than can be done either by insistence on one's own interpretation or by the complacent assumption of most taxonomists that their customary procedure is valid.

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Current Entomological Literature

COMPILED BY V. S. L. PATE, L. S. MACKEY and E. G. FISHER.

Under the above head it is intended to note papers received at the Academy of Natural Sciences of Philadelphia pertaining to the Entomology of the Americas (North and South), including Arachnida and Myriopoda. Articles irrelevant to American entomology will not be noted; but contributions to anatomy, physiology and embryology of insects, however, whether relating to American or exotic species will be recorded.

This list gives references of the current or preceding year unless otherwise noted. All continued papers, with few exceptions, are recorded only at their first installment.

For records of Economic Literature, see the Experiment Station Record, Office of Experiment Stations, Washington. Also Review of Applied Entomology, Series A, London. For records of papers on Medical Entomology, see Review of Applied Entomology, Series B.

Note. References to papers containing new forms or names not so stated in titles are followed by (*); if containing keys are followed by (k); papers pertaining exclusively to neotropical species, and not so indicated in the title, have the symbol (S) at the end of the title of the paper. **The figures within brackets [ ] refer to the journal in which the paper appeared, as numbered in the list of Periodicals and Serials published in our January and June issues. This list may be secured from the publisher of Entomological News for 10c. The number of, or annual volume, and in some cases the part, heft, &c., the latter within ( )follows; then the pagination follows the colon :**
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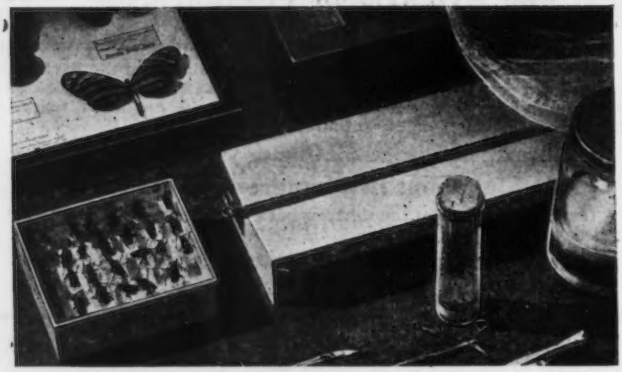

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